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Abstract

Strong growth in Asia, particularly in China, has had a profound impact on the Australian economy over the past decade. Most notable so far has been the boom in the resource sector, with commodity prices and hence Australia's terms of trade rising to historically high levels over a number of years. This has been accompanied by a sizeable appreciation of the exchange rate. While the terms of trade have passed their peak, the substantial investment in productive capacity of the resource sector in recent years is expected to provide a large boost to the production and exports of resources in coming years.

In this paper we describe how the pattern of structural adjustment to the positive terms of trade shock has, to date, proceeded broadly in line with that suggested by a simple theoretical model that distinguishes between three broadly defined sectors: the resource sector, the 'other tradable' sector and the non-tradable sector. In particular, relative wages and prices adjusted in a way that facilitated the reallocation of factors of production towards the resource sector.

While not all parts of the economy have benefited, the process of adjustment thus far has occurred relatively smoothly in a macroeconomic sense; inflation has remained within the target range, or not too far from it, unemployment has remained relatively low and output has grown at close to trend rates. This stands in stark contrast to some earlier episodes of terms of trade booms in Australia. We argue that macroeconomic adjustment to the current terms of trade shock has been facilitated by the appreciation of the exchange rate, the anchoring of inflation expectations and labour market dynamics whereby wage pressures in industries or regions experiencing strong conditions associated with the boom in resource investment have not spilled over to parts of the economy experiencing weaker conditions.

JEL Classification Numbers: E02, E20, N15, N17, Q33, Q43

Keywords: Australian macroeconomy, economic performance, terms of trade, resource boom, industry analysis

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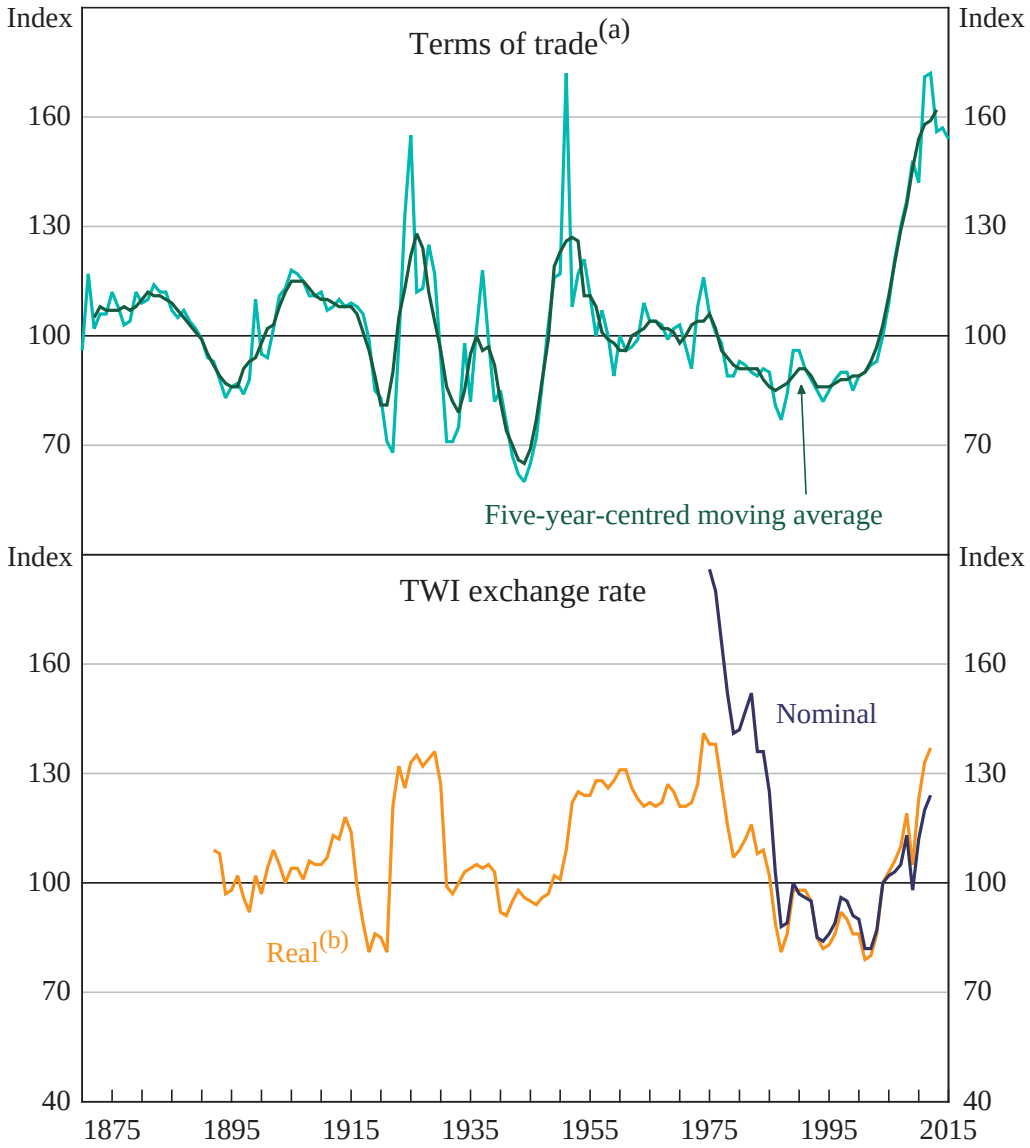
1. Introduction

Strong economic growth in the Asian region, particularly in China, over the past decade or more has had important macroeconomic and structural effects on the Australian economy. Most obvious has been the rise in the terms of trade to historically high levels (Figure 1), an appreciation of the exchange rate, a surge in resource investment, and a reallocation of factors of production, with employment growing strongly in resource and resource-related activities and declining in a number of non-resource industries.

Growth in Asia is providing many benefits for the Australian economy. The commodity-intensive nature of this growth has pushed bulk commodity prices to a high level, which is supporting significant investment in the productive capacity of the Australian resource sector and is expected to continue to support the production and export of resources, as well as employment, incomes, tax revenues and wealth. The appreciation of the exchange rate has lowered the cost of many imported goods for Australian consumers. While not all parts of the economy have benefited from this change in relative prices, for the economy as a whole the process of adjustment has proceeded much more smoothly than has been the case in previous terms of trade booms; over the past eight years, inflation has remained within the target range, or not too far from it, and growth has generally not been too far from trend (Figure 2). This is perhaps all the more notable given the difficult circumstances internationally over recent years, with incomes in Australia growing faster than in most other advanced economies and the unemployment rate remaining relatively low. In part, this reflected the relative strength of the Chinese economy through 2009 and 2010 that benefited Asia and pushed Australia's terms of trade to new highs after they dipped during the height of the global financial crisis.

Figure 1: Terms of Trade and the Exchange Rate

2003/04 = 100, financial year



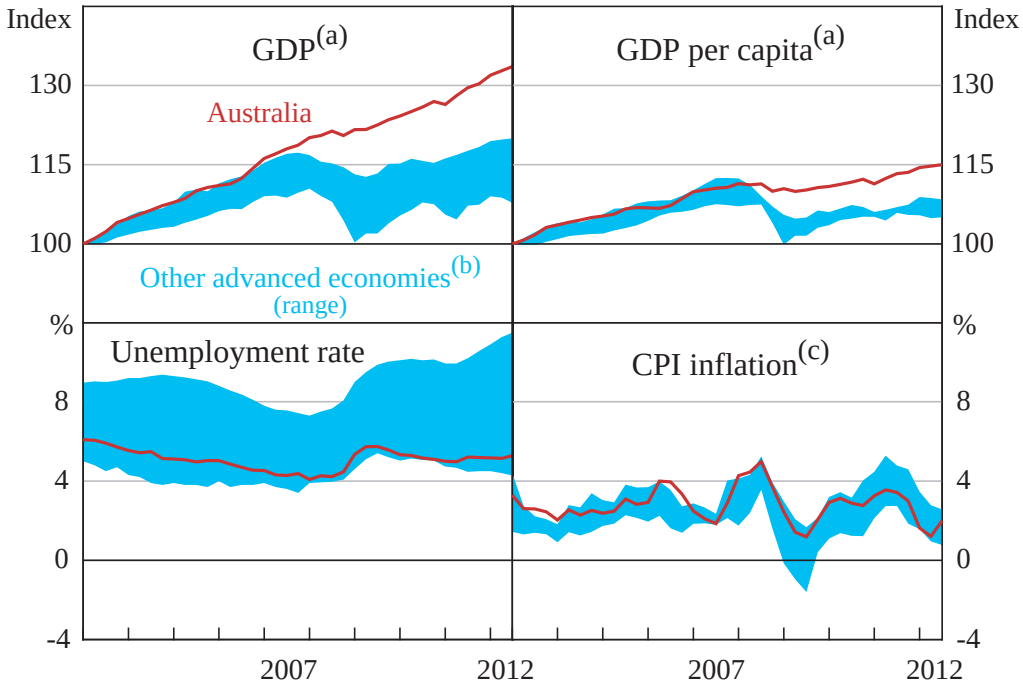
Notes: (a) Includes the February 2013 *Statement on Monetary Policy* (*SMP*) forecasts for 2012/13, 2013/14 and 2014/15, see RBA (2013)

(b) Calendar year data prior to 1970

Sources: ABS; Gillitzer and Kearns (2005); McKenzie (1986); RBA; authors' calculations

Figure 2: Australia's Relative Economic Performance

Quarterly



Notes: (a) March quarter 2003 = 100

(b) Canada, euro area, Japan, NZ, UK and US

(c) Year-ended; excludes Japan

Sources: ABS; Eurostat; Statistics New Zealand; Thomson Reuters; US Census Bureau

The relatively smooth adjustment of the economy overall, at least to date, has certainly not been the norm in previous booms. A key contributor to the good performance of the macroeconomy through the current boom has been the flexibility of the exchange rate. The high nominal exchange rate has acted as a timely mechanism for facilitating the reallocation of labour and capital across industries. Of course, this process is not a painless one. It entails significant pressures on many trade-exposed industries that have not benefited from higher product prices but have faced higher wages (at least in foreign currency terms) and a softening in demand.

As well as promoting the reallocation of labour and capital across the economy, the high exchange rate has been one of the means by which Australian consumers have been able to benefit from high commodity prices, by directly increasing their purchasing power over imports. Indeed, the purchasing power of the average wage has risen in *all* major industries since the terms of trade began to rise in 2003/04,

despite upward pressure on the prices of non-tradable goods and services during the boom.[1] For some industries, such as mining, construction and professional services, the real (consumer) wage has grown quite strongly, while growth in real wages has been more subdued, yet still positive, in rental, hiring & real estate, retail and manufacturing.

Another feature of this terms of trade boom is the greater extent of foreign ownership of the resource sector, with some estimates suggesting that foreign ownership is around four-fifths (Connolly and Orsmond 2011). In addition, the imported content of the current boom in resource investment has been high. Both of these factors mean that the expansionary effect of the boom is less than is implied by the extent of growth in investment and profits in the resource sector.

The adjustment process through the current episode has also been helped by inflation expectations remaining well anchored and greater flexibility in the labour market relative to earlier terms of trade booms. The combination of the high exchange rate, a record of low and stable inflation and a relatively flexible labour market means that while demand for labour, and the growth of wages, has increased in the resource sector, this has not led to a significant increase in wages in Australian dollar terms across the economy as a whole. This was not the case in earlier terms of trade booms.[2]

The smooth adjustment to date suggests that the economy is reasonably well placed to deal with further adjustments that lie ahead. One aspect of this is that the resource boom is expected to turn from one of strong growth in resource investment to one of strong growth in the production and exports of resources. Given that many resource projects employ more labour during the construction and investment phase than during operations, this means that the demand for labour in the resource sector is likely to ease after the peak in investment. Another feature of the adjustment is the decline in the terms of trade from its peak. Indeed, this is already under way, with commodity prices having peaked in late 2011 and forecast to decline further over time as the global supply of commodities gradually increases relative to demand. As with the expansionary phase of the boom, a

1 The purchasing power of the average wage is calculated by deflating average weekly earnings in each industry by the household final consumption deflator.

2 See, for example, Battellino (2010).

flexible exchange rate would also be expected to help the economy adjust to both anticipated and unanticipated developments, such as a path of the terms of trade that varies substantially from that which is expected. Similarly, the path of resource investment, in particular the timing and magnitude of the peak in investment, and the demand for, and supply of, labour in the resource sector are also subject to a degree of uncertainty.

In terms of the path of the terms of trade, an important unknown is the extent to which the growth in the demand for commodities, which has been very strong over recent years, might ease over the longer term as the emerging economies in Asia mature. For example, the rate of urbanisation in Asia, which has driven much of the demand for iron ore and coal, is expected to eventually slow and then stabilise[3] (although demand for non-resource commodities such as food and fibres is likely to increase as populations and incomes grow). Also, the typical pattern of economic development suggests that activity in emerging Asia is likely to become less focused on the production and consumption of goods over time and relatively more focused on the production and consumption of services. While such a transformation might appear to be disadvantageous for countries like Australia that have hitherto focused on supplying these economies with commodities, it may be that Australia is able to benefit from such a shift. Indeed, some Australian service industries, such as education and tourism, have already experienced an increase in demand from Asia, notwithstanding the high level of the exchange rate. Moreover, incomes still have a long way to grow in much of the Asian region to reach levels recorded in the advanced economies. And rising incomes in this large part of the global economy will be relatively advantageous for Australia, in part because the distance from Australia to the region is much less than the distance from Australia to most other advanced economies, but also because of its well-developed and relatively open services sector.

In the remainder of this paper we examine the implications for the Australian economy of strong growth in Asia, particularly in the context of the large increase in the terms of trade since the mid 2000s. Specifically, we examine developments in three broadly defined sectors: the resource sector, the 'other tradable' sector and the non-tradable sector. Section 2 presents a theoretical framework that describes how a small open economy might be expected to adjust to a boom in commodity

3 See, for example, Berkelmans and Wang (2012).

prices. Within the context of this theory, Section 3 then discusses sectoral developments in the Australian economy through the three (overlapping) phases of the resource boom: the increase in the terms of trade; the surge in resource investment; and the subsequent growth in the production and exports of resources. Section 4 concludes.

2. Adjustment to a Commodity Price Boom: A Theoretical Perspective

2.1 The 'Model'

Before turning to the question of how the Australian economy has adjusted to the increase in commodity prices, we first describe how a small open economy such as Australia's might adjust *in theory* to such a boom, drawing on earlier work by Gregory (1976), Corden and Neary (1982) and Corden (1982, 1984). A key part of the adjustment process is the appreciation of the real exchange rate. Much of that can occur via the nominal exchange rate in the case of an inflation-targeting regime with a flexible exchange rate such as that which exists in Australia. The real exchange rate must still appreciate in the case of a fixed nominal exchange rate regime, but more of this occurs through inflation of wages and prices, as was the case in Australia during the Korean War wool boom of the 1950s.[4] By helping to insulate the domestic economy from these inflationary pressures, the flexible exchange rate is an integral part of a smooth transition, and one that provides important benefits to the economy given that, in reality, the future path of the terms of trade is not certain.

To understand the elements of the adjustment process, we briefly describe a small open economy model with three sectors: the resource sector, the 'other tradable' sector and the non-tradable sector; two factors of production – labour and capital, and (mineral and energy) resource endowments. Most of the resource commodities produced are assumed to be exported. Resource endowments can be thought of as being in fixed supply, but of varying quality (that is, some bodies of ore or deposits of oil and gas are more costly to extract than others). Extraction requires building capital 'infrastructure', removing any overburden, digging wells, and building

4 For a discussion of the Korean War wool boom episode, see Appendix A of Plumb, Kent and Bishop (2012).

extraction, processing and transport facilities. All of this takes some years to put in place but then lasts for many years.

In the case of Australia's recent experience, the shock to commodity prices that underpinned the increase in the terms of trade is best thought of as being quite persistent. Even though the exact extent of the boom has been, and remains, uncertain, the key point is that commodity prices rise to a high level for quite some time. They are then expected to decline as more supply is brought forth, at home and elsewhere in the world.

A persistent increase in commodity prices leads to a rise in investment in the resource sector. This takes place over the course of a number of years because it is quite costly, or even impossible, to adjust the capital stock rapidly.

The process of adjustment to the boom in the terms of trade can usefully be characterised as occurring in three overlapping phases.[5] First, commodity prices, and hence the terms of trade, increase significantly. Second, the investment phase entails a build-up in the capital stock in the resource sector over a number of years. This phase is relatively intensive in the use of labour when compared to the third, longer-lived operational phase when production and exports of resources increase significantly. The terms of trade is expected to eventually decline in response to the extra capacity coming on line around the world.

Exactly how the economy responds to the increase in the terms of trade will depend on the response of the exchange rate, interest rates, wages and prices. This will depend in part on the degree of substitutability of labour across the different sectors, as well as the substitutability between tradables and non-tradables in consumption. In what follows, we assume that nominal wages are quite sticky downwards (that is, it takes relatively high levels of unemployment to bring down nominal wages), and that there is some substitutability across sectors, but it may not be not perfect, in which case relative wages across the different sectors might change over time. Similarly, we assume that tradable and non-tradable goods and services are substitutable, but not perfectly so. Finally, we assume that prices

5 To our knowledge, Gregory (2011b) was the first to cast the current resources boom as one that takes place in three distinct phases. See also Sheehan and Gregory (2012), which is forthcoming in the *Australian Economic Review*.

adjust gradually, at least in comparison to the nominal exchange rate in the case where the latter is flexible.

There is a long history of research on how a small open economy adjusts to a boom in its resource sector. The canonical model, which divides the economy into a tradable and non-tradable goods sector, was first described by the Australian economists Salter (1959) and Swan (1960). This model was later extended to include three sectors – a booming tradable sector, a lagging tradable sector and a non-tradable sector – in the so-called 'Dutch Disease models' (Gregory 1976; Corden and Neary 1982; Corden 1982, 1984). The development of these models was motivated by the need to understand better the linkages between structural changes that were taking place in Australia and a number of other countries in the 1960s and 1970s and the development of the resource export sector.[6] A number of commentators have drawn on the predictions of these models to explain the adjustments the economy is currently going through (Gruen 2006, 2011; Henry 2006, 2008; Banks 2011; Connolly and Orsmond 2011; Corden 2012). The contribution of the present study is not to 'reinvent the wheel', but rather to outline the various adjustments that are taking place in Australia, both from a theoretical and empirical standpoint, and to consider the likely transition path of the economy once the 'investment phase' of the boom peaks and the economy moves into the 'production phase' of the boom.

2.2 The Adjustment to the Shock

To think about how the economy responds to the positive terms of trade shock in the context of the theoretical model, it is helpful to start by considering the forces acting on the various 'prices' in the economy (that is, consumer prices, wages, interest rates and the exchange rate) at the onset of the shock. This provides a guide as to how these variables will need to adjust (relative to their baseline paths) to bring about equilibrium.

6 As Gregory (2011a) has noted, another purpose of these models was to increase understanding of the potential effects of two policy instruments that had not generally been used in Australia – a large across-the-board tariff cut and changes in the nominal exchange rate.

A positive shock to the terms of trade, resulting from a rise in commodity prices, increases income accruing to the resource sector and increases that sector's demand for productive inputs. This exerts a degree of inflationary pressure, implying that:

- At initial wages, there will be excess demand for labour emanating from the resource sector. Assuming that the economy begins this adjustment at close to full employment, this will put upward pressure on wages as the resource sector seeks to draw in labour from the 'other tradable' and non-tradable sectors.

- Similarly, at the initial exchange rate, there will be an excess demand for Australian dollars, reflecting an increase in the overall demand for Australian resources and assets that will begin to generate a higher return. The pressure for the appreciation can also be viewed as a forward-looking response to the demand for offshore funds that will be needed to help finance investment in the resource sector. To the extent that the exchange rate appreciates, demand for the exports of the 'other tradable' sector will decline.

- At initial prices of goods and services, extra income associated with the terms of trade shock implies an excess demand for the output of the non-tradable sector, which will tend to put upward pressure on prices and wages in that sector. To the extent that the exchange rate appreciates, downward pressure on the prices of imported goods could induce substitution away from non-tradable goods and services, or free up income to spend on non-tradable goods and services. Given these opposing forces, the net outcome for demand in the non-tradable sector is not clear *a priori*. Upward pressure on prices will also be reduced to the extent that profits associated with the terms of trade shock accrue to foreigners and investment is sourced from imports.

- Upward pressure on wages and prices associated with demand from the resource sector, and any excess demand in the non-tradable sector, might require an increase in interest rates in order to contain inflation; this will depend in part on the extent of the exchange rate appreciation. Also, the need for interest rates to rise will be lessened to the extent that inflation expectations remain well anchored and wage pressures in stronger parts of the economy do not spill over to other parts.

Pulling all of this together implies the following. The positive terms of trade shock will cause the nominal exchange rate to appreciate. By itself this pushes up Australian wages in foreign currency terms and thereby frees up labour from the 'other tradable' sector – that is, the rise in wages in foreign currency terms represents a loss of competitiveness for this sector. What happens to wages in Australian dollar terms will depend on the extent of the nominal exchange rate appreciation, whether demand for non-tradable goods and services rises or falls, and the substitutability of labour across sectors. It is likely that wages in Australian dollar terms will rise in the resource and non-tradable sectors relative to the 'other tradable' sector. To the extent that wages in Australian dollar terms rise overall (again, relative to the baseline), the real exchange rate appreciates further than is implied by the nominal exchange rate appreciation alone. In any case, there is a clear signal for labour to leave the 'other tradable' sector and move towards the resource sector (and possibly the non-tradable sector if its demand also rises).

In theory at least, at the time of the terms of trade shock, the nominal exchange rate will jump higher and interest rates will rise. The interest rate differential (vis-à-vis the rest of the world) means that the exchange rate can then be expected to depreciate in a smooth fashion along the path of adjustment. This is because arbitrage in the foreign exchange market requires the expected return on holding Australian dollar assets to be equal to the expected return on foreign currency assets.[7] The higher interest rate during the course of adjustment will also discourage some investment outside of the resource sector.

What can we say about prices? Domestic inflationary pressures, associated with higher wages and incomes, will lead to higher inflation for non-tradable goods and services but, at the same time, the gradual pass-through of the initial exchange rate appreciation will lead to lower inflation for tradable goods and services (whose prices in foreign currency terms depend to an extent on global considerations). In this way, the appreciation of the exchange rate helps to offset the inflationary impulse from the terms of trade shock, and assists in maintaining inflation in line with the inflation target.

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7 The theory of uncovered interest parity (UIP), which connects expected changes in the exchange rate to interest differentials, is central to many international macroeconomic models. Yet empirically, UIP is consistently found not to hold (for a survey, see Engel (1996)).

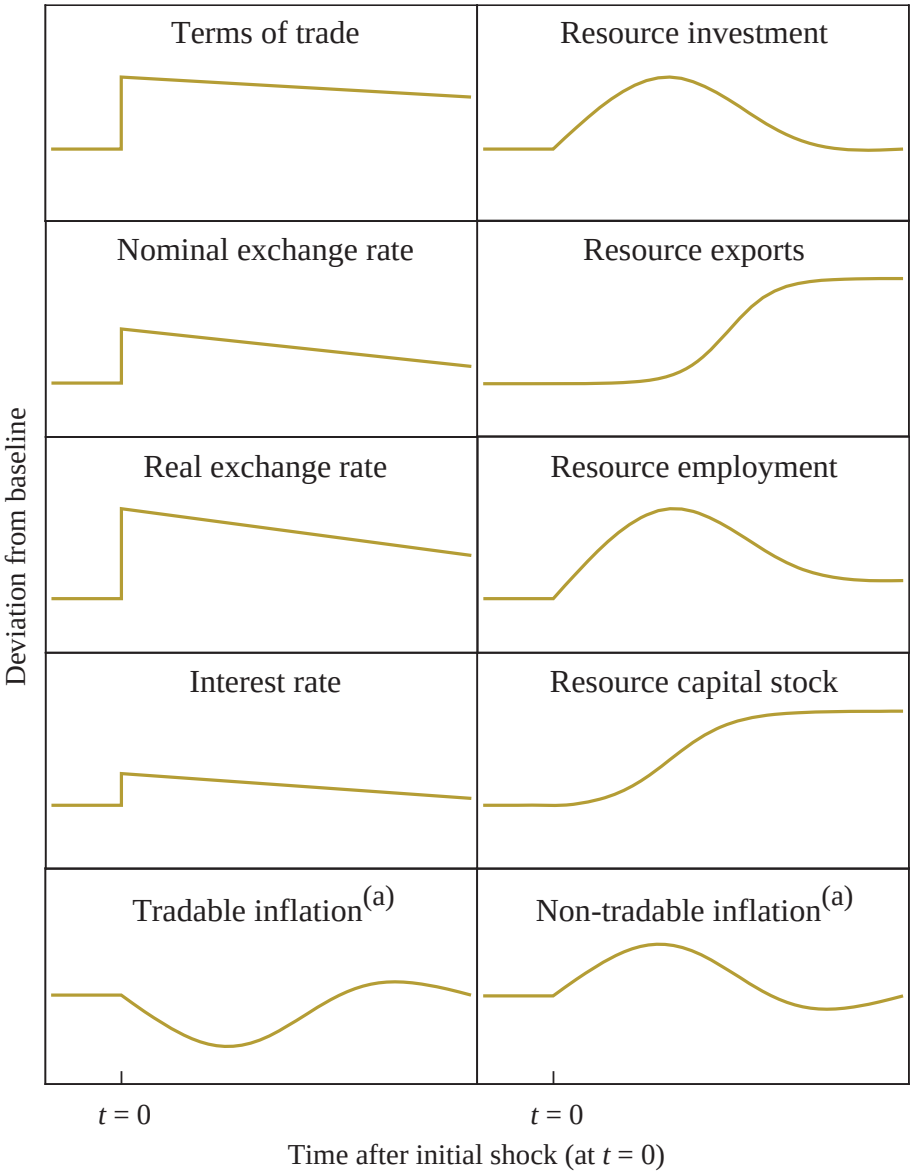
These changes will unwind to some extent as the adjustment process runs its course. As the capital stock in the resource sector reaches its new equilibrium level, demand for labour in the resource sector overall will decline as the relatively labour-intensive investment there declines. Even so, labour demand in the resource sector will still remain somewhat higher than it was prior to the terms of trade shock given the operational needs associated with producing more output. The net reduction in labour demand in the resource sector when moving from the investment to the operational phase of the boom implies that labour needs to be reabsorbed into the non-resource sector. This will tend to put some downward pressure on wage growth, although this effect will be mitigated somewhat to the extent that the demand for non-tradable goods has increased since the onset of the terms of trade shock (that is, if the income effect has outweighed the substitution effect). The reduction in wage growth that does occur, when coupled with some improvement in the competitiveness of the 'other tradable' sector due to the exchange rate depreciation (that begins, in theory, immediately after the unexpected boom to the terms of trade and initial appreciation), will help the non-resource sector to absorb the labour being shed by companies that undertook the resource investment.

The price changes seen during the investment phase of the boom will be at least partly reversed during the operational phase of the boom. In particular, the gradual depreciation of the exchange rate (following the initial appreciation) will put upward pressure on tradable inflation over time, while a reduction in wage growth will put downward pressure on non-tradable inflation. These opposing effects may result in little net change to overall inflation. In this case, inflation can again remain in line with the target and the interest rate can return to its neutral level. In line with this discussion, Figure 3 provides a stylised illustration of how key variables might respond to a persistent positive shock to global commodity prices.

In reality, there are a number of reasons why an economy might not adjust in accordance with the theory outlined above; for example, households, firms and authorities do not have perfect knowledge of the timing and magnitude of the terms of trade boom at the outset, and it takes time for firms to adjust to changing circumstances. There are also many forces affecting the economy at a given point in time, making it difficult to isolate the impact of a single shock. Nonetheless, the

theory provides a useful heuristic framework for analysing the response of the Australian economy to the resource boom.

Figure 3: Stylised Dynamics of Key Prices and Quantities Following a Persistent Positive Shock to Global Commodity Prices



Note: (a) Refers to consumer prices

3. The Resource Boom and Structural Change

Developments in the Australian economy since the onset of the current resource boom have been broadly consistent with the stylised framework outlined in Section 2. In response to the large increase in commodity prices and the terms of trade, investment and employment in the resource sector grew strongly, placing upward pressure on prices and wages. This was offset to some extent by an appreciation of the exchange rate, which led to a loss of competitiveness and downward pressure on prices in other industries exposed to foreign trade.

This section examines these developments in more detail, by considering the three (overlapping) phases of the resource boom:

- Phase I: increase in the terms of trade.
- Phase II: surge in resource investment.
- Phase III: mining production and export phase.

We look at how key variables in the resource, 'other tradable' and non-tradable sectors have evolved over recent years, while also noting some important ways in which developments in the Australian economy are not well represented by the theoretical framework presented in Section 2.

Our measure of the 'resource sector' is based on the measure of the 'resource economy' outlined in Rayner and Bishop (2013).[8] In this measure, the resource sector is defined broadly to include both resource extraction and resource-related activity:

- Resource extraction. This includes mineral and gas extraction, and also resource-specific manufacturing (such as the production of metals and refined petroleum). This is very close to the ABS' definition of the mining industry, the only difference being that it also includes resource-specific manufacturing.

8 The methodology detailed in Rayner and Bishop builds on that in Kouparitsas (2011), which was implemented in Gruen (2011).

- Resource-related activity. This includes the provision of intermediate inputs that are used in the current extraction of resources as well as investment that supports future extraction of resources. In other words, it captures activities that are directly connected to resource extraction, such as constructing mines and associated infrastructure, and transporting inputs to, and taking extracted resources away from, mines. It also captures some activities less obviously connected to resource extraction, such as engineering and other professional services (legal and accounting work, for example).

The remainder of the economy – the non-resource sector – can usefully be divided into two parts:[9]

- 'Other tradable' sector: comprises industries (or parts of industries) that are significantly exposed to international trade, but not directly related to the resource sector. This includes agriculture, manufacturing, transport, wholesale trade and accommodation & food services. For each of these industries, exports or competing imports are significant as a share of gross output.

- Non-tradable sector: comprises industries that typically do not have a significant exposure to international trade, and for which production is not directly linked to the resource sector.

9 Rayner and Bishop (2013) provide estimates of the gross value added (GVA) and employment in each industry that is directly connected to the resource sector. For this reason, in the 'other tradable' and non-tradable sectors used in the current paper, the parts of industries that are directly related to the resource sector are removed. This means that part of manufacturing GVA and employment is classified to the resource sector and part to the 'other tradable' sector, for example. The approach is different for sectoral estimates of investment and wages, which are based on the simple industry classification in Table A1.

The literature proposes several methods for creating this division (of the non-resource economy) in practice; see Dwyer and Groeger (1994) for a review. Our allocation is consistent with a 'threshold' approach, in which industries are allocated to the 'other tradable' sector if either their exports or competing imports are greater than a certain share of their gross output (generally 10 per cent; see Table A1).[10]

The key prices and quantities of interest are shown in Table 1, which compares the inflation-targeting period up to 2002/03 with the period of the rapidly rising terms of trade thereafter.

10 More precisely, an industry is classified to the 'other tradable' sector if more than 10 per cent of its total production was exported, or if competing imports accounted for more than 10 per cent of the industry's total supply, in 2008/09. The 'other tradable' sector in this article differs slightly from that in the previous version of this paper (Plumb *et al* 2012). In the current paper, the wholesale trade industry is also included in the 'other tradable' sector, reflecting updated information from the 2008/09 input-output tables.

Table 1: Key Prices And Quantities

Annual average growth, per cent

	Pre terms of trade boom 1992/93–2002/03	Terms of trade boom 2003/04–2011/12
Terms of trade	½	7
Nominal TWI exchange rate	–¾	4
Real TWI exchange rate	–1	5¼
Borrowing rates (housing)[(a)]	7¾	7
Borrowing rates (business)[(a)]	8	7¼
Consumer price index[(b)]	2½	2¾
Tradable	2	1½
Non-tradable	2¾	4
Wage price index[(c)]	3¼	3¾
Resource/mining	3	4¾
Other tradable	3	3½
Non-tradable	3¼	4
Real investment	6¼	6½
Resource	5¼	22¼
Other tradable	5½	4¼
Non-tradable	7	4¾
Employment	2	2¼
Resource	½	11¼
Other tradable	0	–1
Non-tradable	2¾	2¼
Real output (GVA)	3¾	3
Resource	3¾	6½
Other tradable	3	¾
Non-tradable	4½	3
Real exports	6	3
Resource	5½	3½
Non-resource	6	2

Notes: (a) Average of nominal interest rates on outstanding loans (fixed and variable); pre terms of trade boom average is 1993/94–2002/03

(b) Consumer price data exclude interest charges prior to September quarter 1998 and deposit & loan facilities to June quarter 2011, and are adjusted for the tax changes of 1999–2000

(c) Pre terms of trade boom average is 1997/98–2002/03

Sources: ABS; APRA; Perpetual; Rayner and Bishop (2013); RBA; authors' calculations

3.1 Phase I: Rise in the Terms of Trade

Australia experienced a large increase in its terms of trade, rising by 82 per cent since 2003/04 to reach their highest level on record in September 2011; they have subsequently declined by around 17 per cent.

This run-up in the terms of trade has provided a significant boost to the real purchasing power of domestic production, given that a larger volume of imports can be purchased with a given volume of exports. For example, Stevens (2010) noted that, prior to the terms of trade boom, a ship load of iron ore was worth about 2 200 flat screen television sets. In 2010, it was worth about 22 000 flat screen television sets. This is akin to saying that Australians have received a transfer of income from the rest of the world. The increase in purchasing power flowing from a rise in the terms of trade can be estimated by comparing real GDP to real gross domestic income (GDI). Since the mid 2000s, growth in real GDI has exceeded that in real GDP by around 10 percentage points. However, Australians did not receive all of this transfer of income from the rest of the world, given that part of the resource sector is foreign-owned.

The distribution of these real income gains across the economy depends, crucially, on how much the exchange rate appreciates in response to the increase in world commodity prices (RBA 2005). An appreciation of the exchange rate means that: the increase in the domestic currency price of commodity exports will be less than the increase in world commodity prices; the income of the ‘other tradable’ sector will fall; and real income gains flow to the broader economy via the associated decline in the price of imports.

The exchange rate has played a particularly important role in smoothing the effects of terms of trade shocks in Australia during periods of rising commodity prices.[11] Since the terms of trade started to rise in 2003/04, the nominal exchange rate has appreciated by around 25 per cent in trade-weighted terms. Thus, as described in Blundell-Wignall and Gregory (1990), most of the real exchange rate appreciation necessary to maintain internal balance following the terms of trade shock has been achieved by an appreciation of the nominal exchange rate. This has not been the case in much earlier terms of trade booms in Australia, during which the exchange rate was either fixed or heavily managed, when much of the adjustment to the real exchange rate was achieved via higher inflation.

However, the nature of the increase in commodity prices and the terms of trade, and the exchange rate appreciation, demonstrates a clear distinction between the theory presented in Section 2 and the reality of the current boom. In particular, the large rise in the terms of trade occurred over a number of years, rather than a one-off jump, and the extent of the rise was largely unexpected. This reflects the fact that the pace of development in emerging Asia consistently exceeded expectations (Figure 4). As a result, analysts (including official forecasters) under-predicted the extent of the increase in commodity prices, and therefore the terms of trade, and so the associated exchange rate appreciation also occurred over a number of years.

11 See Blundell-Wignall and Gregory (1990), Gruen and Wilkinson (1994) and Debelle and Plumb (2006) for a discussion of episodes following the floating of the Australian dollar in 1983.

Figure 4: Chinese GDP Growth and the Terms of Trade

Notes: (a) Annual average

(b) As at January of first forecast year

(c) The latest forecast is at the February 2013 *SMP*; the latest reading is December quarter 2012, which was published after the February *SMP*

Sources: ABS; CEIC; Consensus Economics; RBA

3.2 Phase II: Surge in Resource Investment

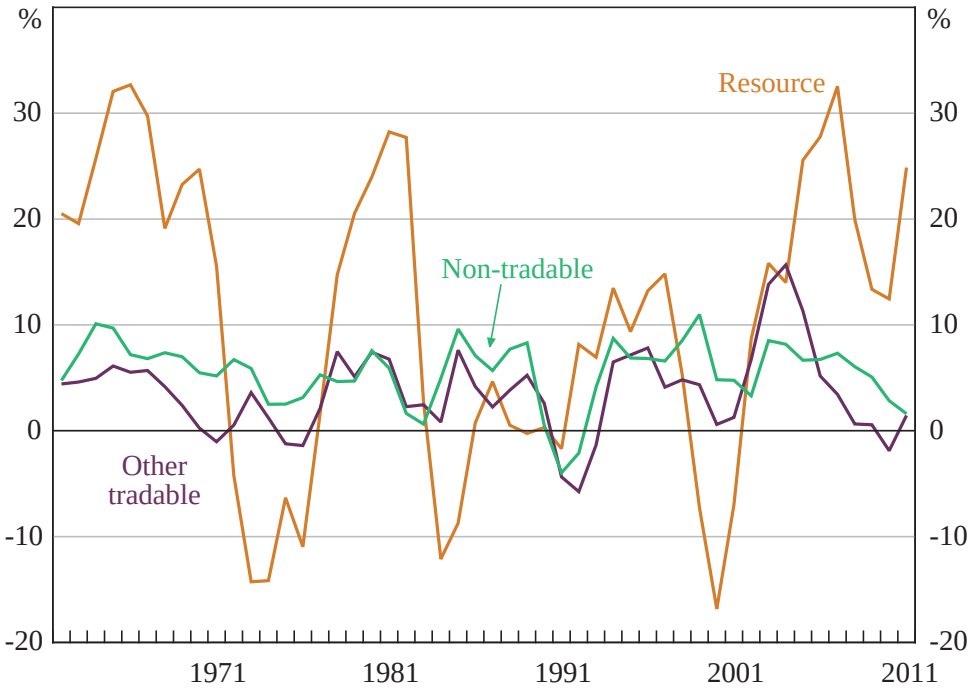
3.2.1 Investment

The resource sector globally has responded to the large rise in commodity prices by expanding its productive capacity. This has occurred gradually over a number of years, reflecting the unforeseen magnitude of the increase in commodity prices and the time required to plan for, approve and then complete large investment projects. In Australia, the growth in investment in the extraction of iron ore, coal and liquefied natural gas (LNG) has been exceptionally strong over recent years, accounting for most of the strong growth of resource sector investment (Figure 5). Indeed, the net capital stock of the resource sector is estimated to have risen by more than 150 per cent in real terms since 2003/04, and is expected to continue to grow rapidly over the next few years, particularly in the LNG sector. At the time of the Bank's February 2013 *Statement on Monetary Policy* (*SMP*), the central forecasts for growth embodied the expectation that investment in the resource sector would peak at a little over 8 per cent of GDP in 2012/13, compared to its average of 2 per cent of GDP over the past half century.

The effect of this surge in investment on GDP is lessened by the fact that a significant share of the investment is imported. In aggregate, it appears that around half of the value of these resource investment projects is imported, although this varies somewhat depending on the nature of the project. LNG projects, for example, typically involve higher shares of imported capital inputs. (The estimates of resource sector GVA presented in Section 3.2.2 of this paper have adjusted the value of mining investment for its estimated import content.)

Figure 5: Real Investment Growth by Sector

Three-year-centred moving average, financial year



Sources: ABS; authors' calculations

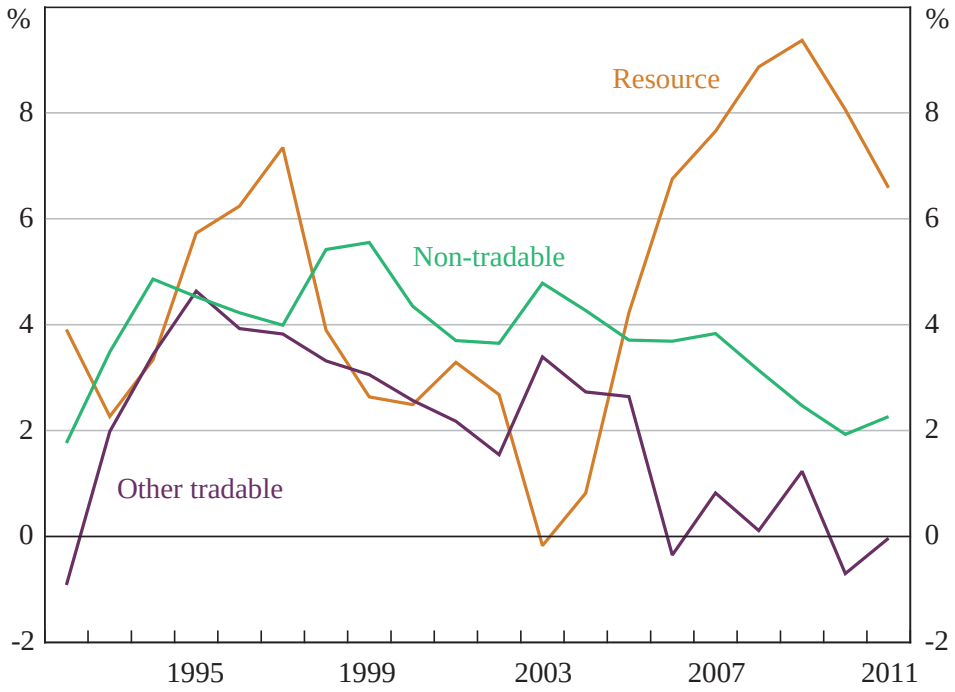
In contrast, investment growth in the 'other tradable' and non-tradable sectors has slowed over recent years (Table 1 and Figure 5). Growth in 'other tradable' productive capacity has been particularly soft, which may reflect, in part, the high level of the exchange rate, whereas the slowing in growth in non-tradable capacity may reflect other forces acting on demand and confidence in this sector (see below).

3.2.2 Impact of the surge in resource investment on the output of other sectors

As the surge in resource investment gathered pace, the output of the broader resource sector, as measured by its gross value added (GVA), increased strongly (Figures 6 and 7). This is particularly notable for the resource-related construction and business services industries, which have supplied a large quantity of inputs required for resource extraction and investment.

Figure 6: Real GVA Growth by Sector

Three-year-centred moving average, financial year

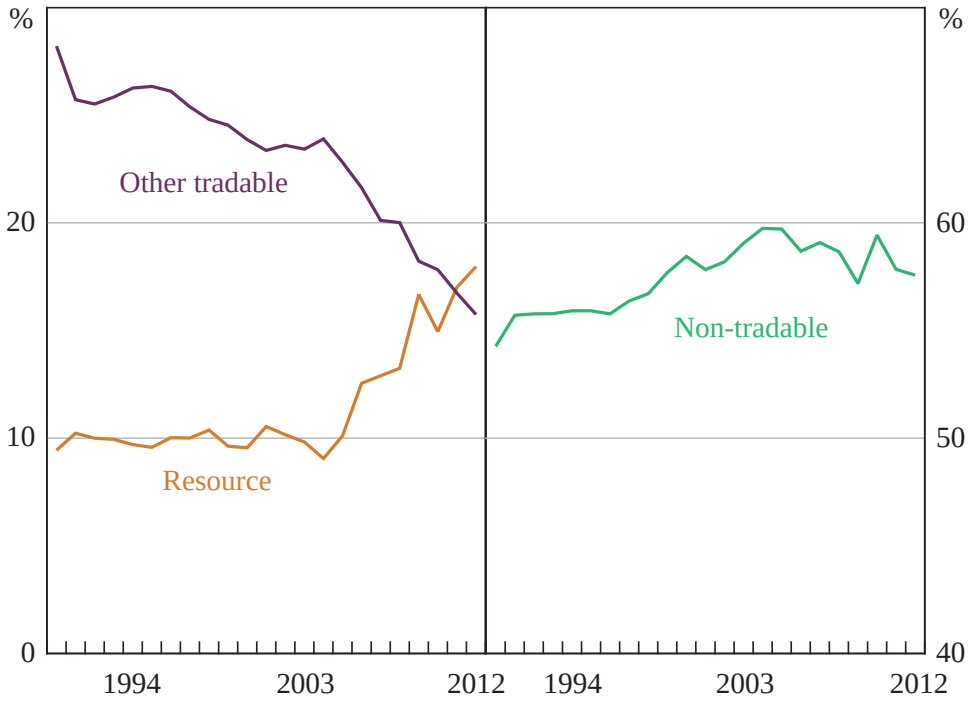


Sources: ABS; Rayner and Bishop (2013); authors' calculations

To sustain the growth in the resource sector, factors of production were drawn from the 'other tradable' and non-tradable sectors, and GVA growth in those sectors slowed. In the case of the 'other tradable' sector, total GVA even declined in some years, with particular weakness in parts of manufacturing that do not supply many inputs to the resource sector, such as textiles, clothing & footwear and wood & paper manufacturing. Growth in GVA of the non-tradable sector has also slowed, but by less than the 'other tradable' sector. This suggests that the 'income effects' generated by the higher terms of trade (which tend to boost demand for non-tradable goods and services) outweighed the 'substitution effects' created by the fall in the price of tradable goods and services relative to the price of non-tradables (which tend to diminish demand for non-tradables relative to tradables).

Figure 7: GVA by Sector

Share of nominal GVA, financial year



Note: The sum of the shares does not equal 100 per cent due to the exclusion of ownership of dwellings

Sources: ABS; Rayner and Bishop (2013); authors' calculations

It should also be noted that there have been factors other than the large increase in commodity prices and the high exchange rate that have had an effect on economic activity in Australia. For example, the global financial crisis caused significant disruption to financial markets and economic activity, albeit to a much lesser extent in Australia than in the north Atlantic economies. There was also an increase in the rate of household saving from the early 2000s, a slowing in credit growth and a transition to more stable levels of indebtedness and housing prices (relative to incomes). In addition to its direct impact on financial sector output, this has contributed to weakness in non-resource construction and turnover in the established housing market, as well as slower growth of retail spending than the strong growth experienced in the years prior to the global financial crisis (Lowe 2012b; Stevens 2012). Furthermore, there was a relatively broad-based slowing in Australia's productivity growth from the early 2000s; some but certainly not all of this can be explained by developments in the resource sector (D'Arcy and Gustafsson 2012).

3.2.3 Employment

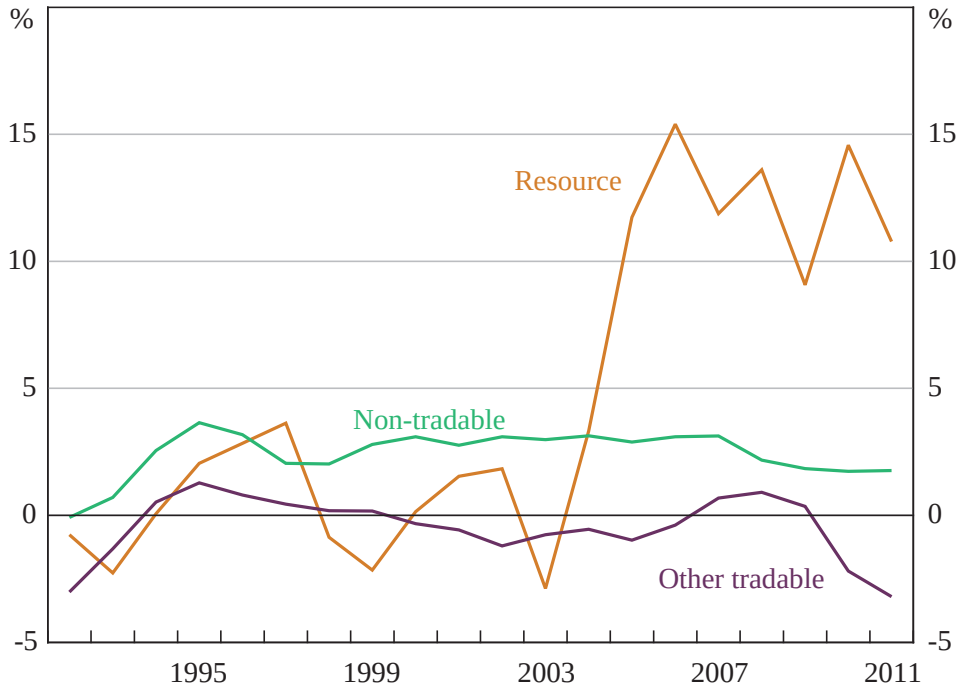
Following the onset of the terms of trade boom, aggregate employment grew at an above-trend pace. The composition of employment growth also changed significantly (Figures 8 and 9). The share of total employment accounted for by the resource sector (including both resource extraction and resource-related activity) doubled since the mid 2000s, to be around 9¾ per cent in 2011/12.[12] Around two-fifths of this growth reflected the expansion in resource investment, which increased demand for labour in resource-related construction and other industries that provide inputs to these investment projects (such as some types of machinery manufacturing and engineering services). The share of workers employed in resource extraction accounted for only about one-quarter of the overall increase in the resource sector's share of employment since the mid 2000s, while the remainder has been due to an increase in employment in industries that service the operations of mines (such as transport of output from mine sites to ports, business services and power generation).

Once the peak in resource investment has passed and the extraction of resources increases, the share of labour employed in the more labour-intensive resource-related sector is likely to decline and the share employed in the less labour-intensive resource extraction sector is likely to rise. The expected net effect though is a decline in labour demand in the resource sector.

12 These estimates for employment assume that the productivity of a worker who works in a particular industry will be the same if they supply their labour to the resource or non-resource sectors of the economy (see Rayner and Bishop (2013)).

Figure 8: Employment Growth by Sector

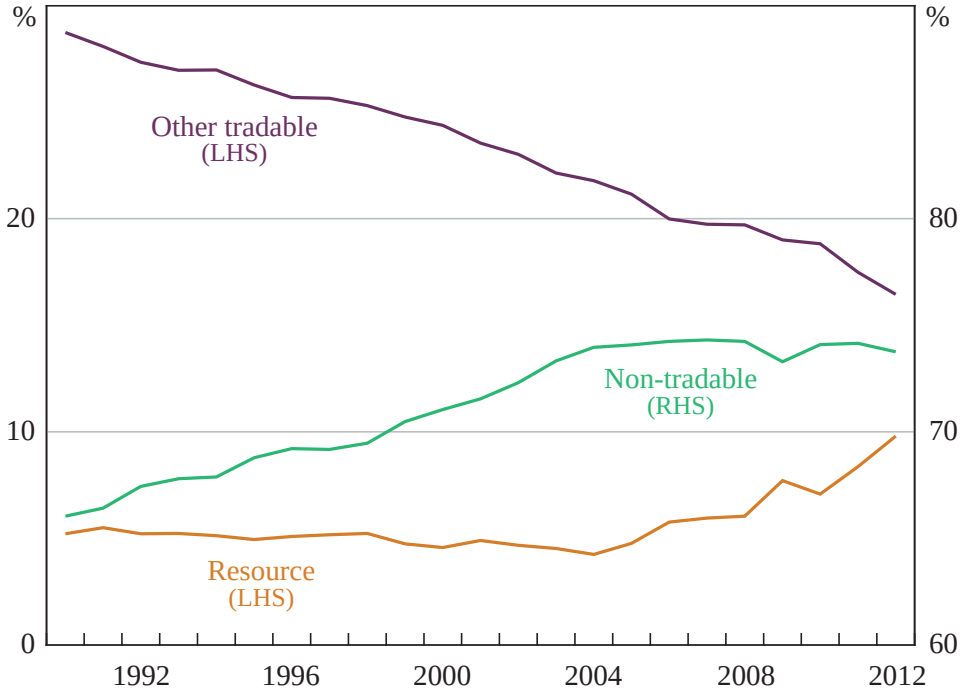
Three-year-centred moving average, financial year



Sources: ABS; Rayner and Bishop (2013); authors' calculations

Figure 9: Employment by Sector

Share of total employment, financial year



Sources: ABS; Rayner and Bishop (2013); authors' calculations

Employment outcomes in the 'other tradable' and non-tradable sectors are consistent with labour moving to the resource sector in response to the higher relative wages on offer (see below), but could also reflect other factors. In contrast to the strong employment growth in the resource sector, employment growth has slowed in the non-tradable sector (particularly in retail and the parts of construction not exposed to the resource sector). The share of labour employed in the non-tradable sector has plateaued since around the mid 2000s, and is in line with the relatively stable share of non-tradable goods and services in production. However, as noted above, other developments largely unrelated to the high level of the terms of trade and the exchange rate are likely to have played a role in the stabilisation of the share of employment and output in the non-tradable sector. Most obvious is the weakness in the housing market; as a share of nominal GDP, dwelling investment peaked in 2003 at about 6½ per cent and has trended down to be around 4¾ per cent in 2012.

Employment growth has been even weaker in the 'other tradable' sector, and its share of employment has fallen since the mid 2000s (particularly in manufacturing). It is worth noting, however, that the recent decline in the 'other tradable' sector's share of total employment is a continuation of a longer-run structural shift since the 1960s. As real incomes have risen, consumer demand has shifted increasingly toward services, and this, combined with deregulation and privatisation of a range of services industries and the reduction in the level of trade protection provided to goods-producing industries, has seen the tradable sector's share of employment decline, and the non-tradable (service) sector's share increase.[13]

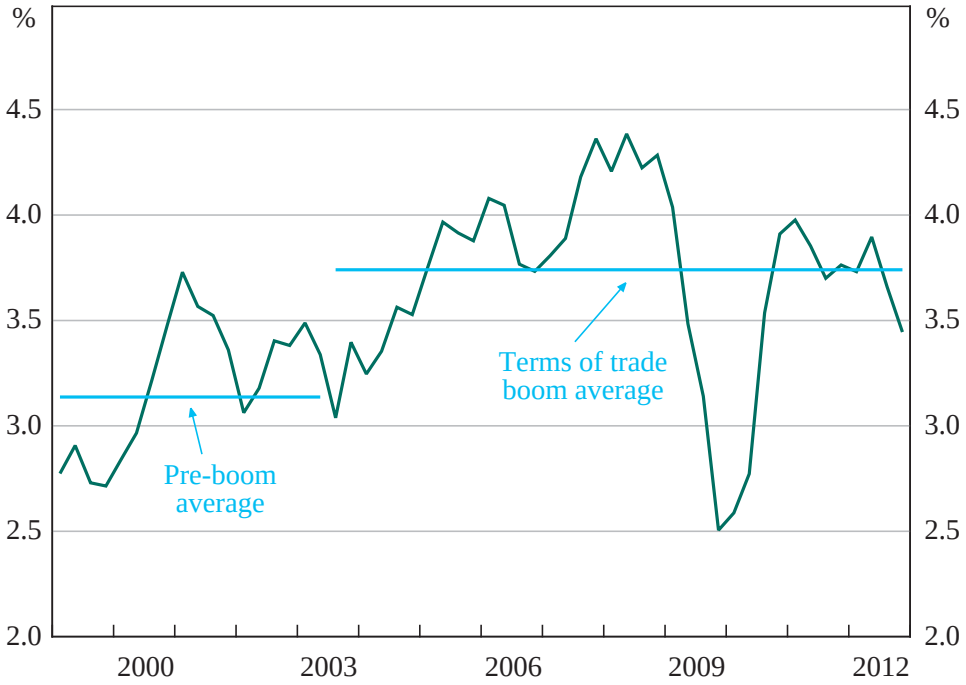
13 This structural trend is particularly evident for manufacturing, whose share of employment fell from one-quarter in the 1960s to less than one-tenth in 2012.

3.2.4 Wages

The pace of aggregate wage growth picked up between 2003 and 2008 (Figure 10). This reflected considerable pressures on capacity in the economy prior to the global financial crisis, with the unemployment rate declining to its lowest level in more than three decades. When the slowdown associated with the global financial crisis occurred, these pressures on capacity eased and there was a significant moderation in wage growth. Aggregate wage growth subsequently picked up from these earlier low levels as activity recovered.

Figure 10: Wage Price Index Growth

Private sector, year-ended



Notes: Pre-boom average is 1997:Q3–2003:Q2; terms of trade boom average is 2003:Q3–2012:Q4

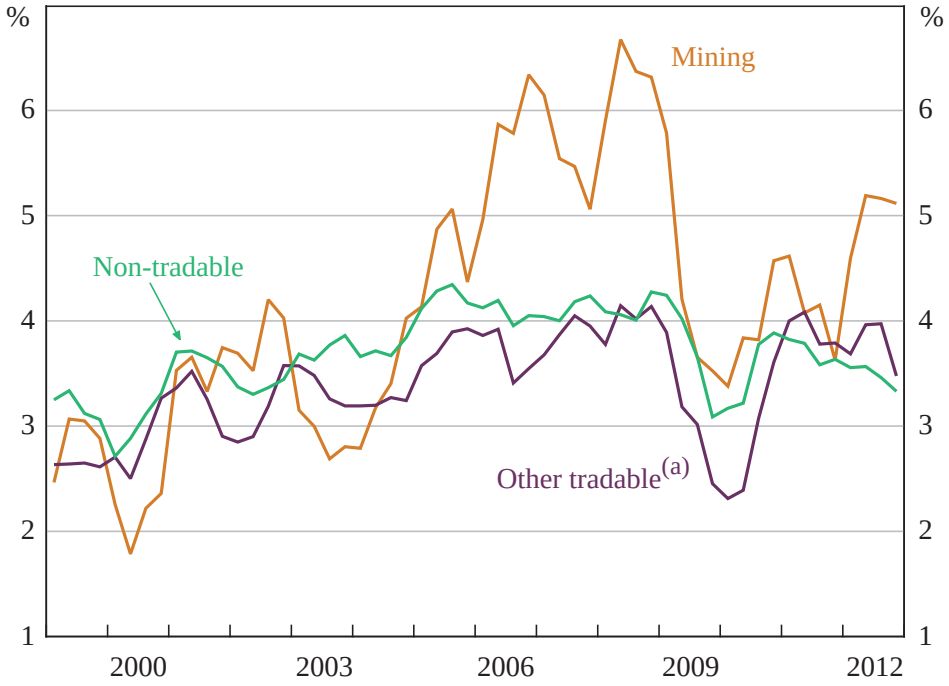
Source: ABS

Wages have risen more rapidly in the mining industry than in the rest of the economy since the beginning of the terms of trade boom, with much of this adjustment occurring between 2004 and 2008 (Figure 11). As a result, the *relative* wage in mining increased by about 9 per cent over the eight years to 2012 (Figure 12). This was by far the largest increase of any single industry, after having

trended lower over the decade leading up to the boom.[14] It also appears that relative wages increased in sectors complementary to resource extraction, principally resource-related construction and mining services.[15]

Figure 11: Wage Price Index Growth by Sector

Year-ended



Note: (a) Excludes agriculture

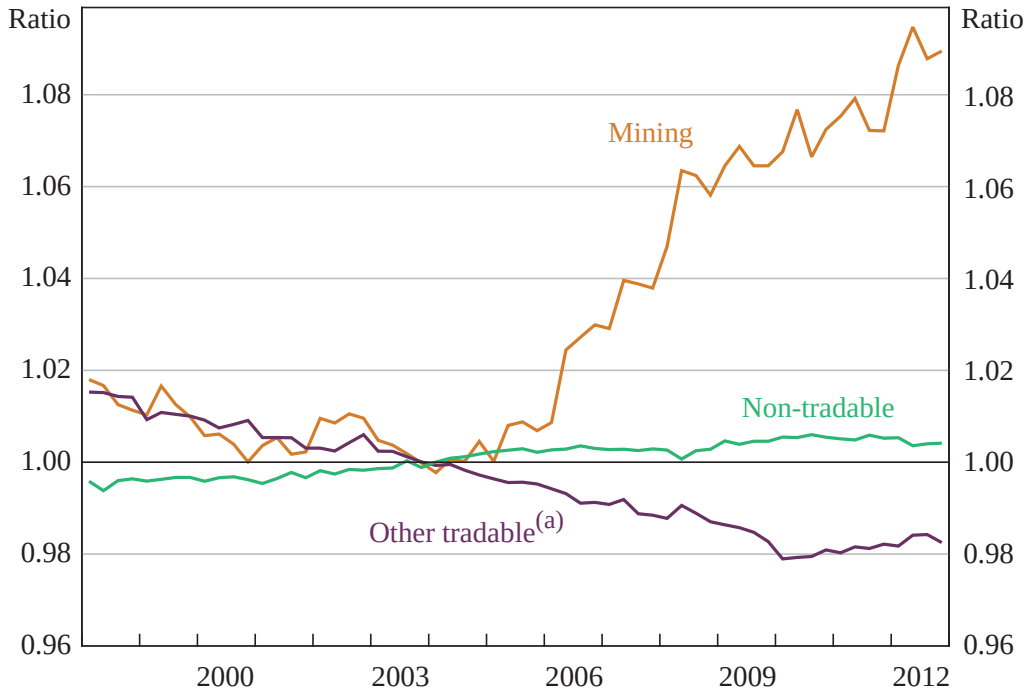
Sources: ABS; authors' calculations

14 In this section, mining is defined as resource extraction excluding resource-specific manufacturing.

15 Wages in construction and professional services increased strongly between the mid 2000s and 2012, relative to other industries. While ABS data on wages cannot be disaggregated into resource- and non-resource-related construction and business services, the RBA's liaison program suggests that the wage data by industry are likely to mask stronger growth in resource-related construction and services and weaker outcomes in construction and services not exposed to the resource sector.

Figure 12: Relative Wage Levels

Sector WPI as a ratio to aggregate WPI, 2003/04 average = 1.0



Notes: WPI refers to the wage price index

(a) Excludes agriculture

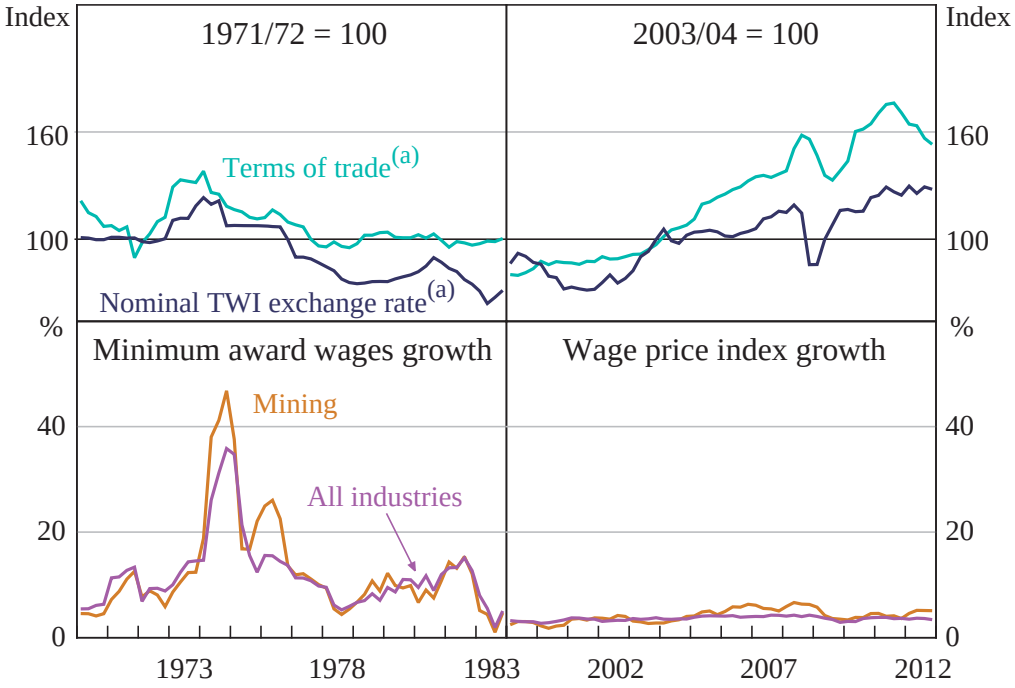
Sources: ABS; authors' calculations

There was very little movement in the relative wage in the non-tradable sector overall and a decline in the 'other tradable' sector. This has been a key mechanism facilitating the reallocation of labour between sectors, whereby sectors benefiting from output price increases can afford to pay the higher wage rate and so draw labour away from other sectors.

While these adjustments in relative wages were substantial, the adjustment to the *absolute* level of nominal wages overall was smaller than in previous terms of trade booms, such as the early 1970s energy boom (Figure 13). This outcome in the current resource boom was helped by the combination of well-anchored inflation expectations and a more flexible labour market, particularly in comparison to earlier terms of trade booms. During these earlier booms, inflation was more variable and Australia's centralised wage-setting system had the effect of spreading wage increases across the economy to occupational categories for which the value of marginal product had not increased. Not surprisingly then, the result was a rise in inflation and unemployment (Gruen 2006; Battellino 2010;

Banks 2011). While the adjustment of relative wages during the current boom has been substantial, the need for relative wages to adjust may have been lessened by a number of factors that have increased the supply of labour to the resource sector, such as: the adjustment in participation rates across different regions; the utilisation of skilled labour sourced from offshore by the resource sector; interstate migration; and employment practices such as fly-in fly-out and drive-in drive-out arrangements (see D'Arcy *et al* (2012) for details).

Figure 13: Resource Booms and the Macroeconomy



Note: (a) Log scale

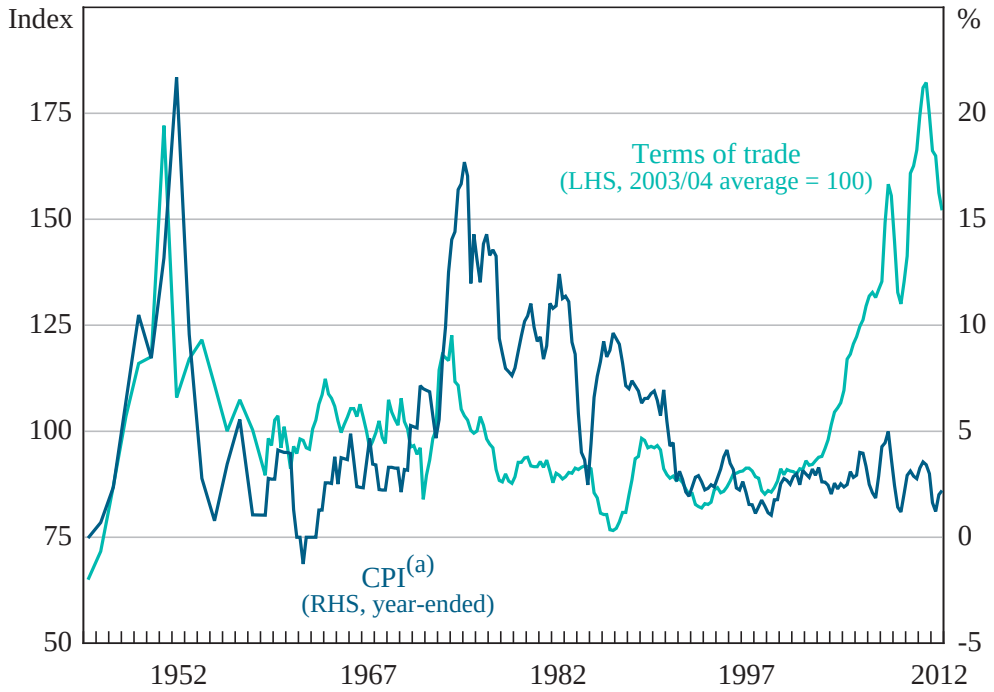
Sources: ABS; RBA

3.2.5 Consumer prices

Consumer price inflation has averaged around 2¾ per cent since the mid 2000s (Table 1). This is within the inflation target of 2–3 per cent over the cycle, but marginally higher than the average of 2½ per cent over the preceding decade. Even so, this can be considered as a relatively good outcome given the magnitude of the shock to the terms of trade, and also the much higher inflation outcomes associated with previous resource booms in Australia (Figure 14).

Figure 14: Terms of Trade and Consumer Price Inflation

Quarterly



Notes: Financial year data prior to 1959

(a) Excluding interest charges prior to September quarter 1998 and adjusted for the tax changes of 1999–2000

Sources: ABS; Gillitzer and Kearns (2005); RBA

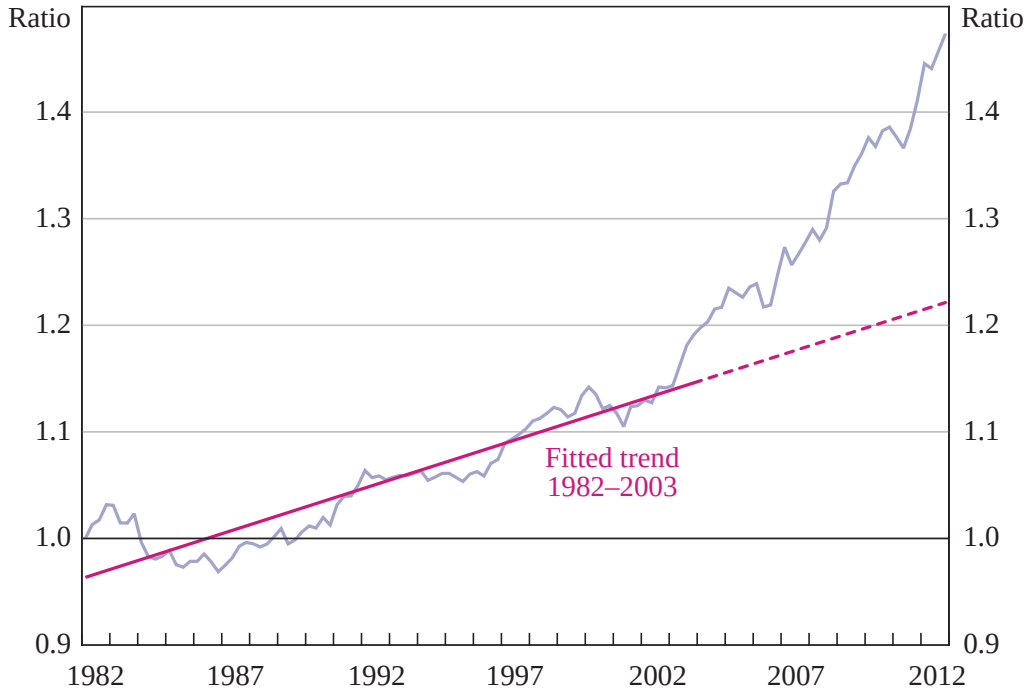
While inflation has been well contained, there were large shifts in relative consumer prices. Non-tradables inflation throughout the period of the terms of trade boom was stronger relative to its pre-boom average, as higher domestic cost pressures fed through to prices. Other factors less directly related to the resource investment boom also contributed to higher non-tradables inflation. For example, utilities price inflation picked up significantly from 2007, reflecting the move towards cost-based pricing, the replacement and expansion of infrastructure, and rising input costs (Plumb and Davis 2010). Productivity growth has also slowed since the early 2000s, although it is estimated to have picked up more recently.

At the same time, the higher exchange rate contributed to a noticeable decline in tradables inflation. Hence, the ratio of non-tradable to tradable consumer prices rose much more rapidly after 2003 compared to the trend of the previous two

decades (Figure 15).[16] This earlier underlying trend reflects the Balassa-Samuelson effect, whereby productivity tends to rise more rapidly in the tradable sector than the non-tradable sector. So, even though wages will tend to equalise across sectors over the longer run, unit labour costs rise more rapidly in the non-tradable sector.[17] The fact that the ratio of non-tradable prices to tradable prices has risen faster than this earlier trend is consistent with the theory outlined in Section 2.

Figure 15: Ratio of Non-tradable to Tradable CPI

March quarter 1982 = 1.0



Notes: Adjusted for the tax changes of 1999–2000; non-tradable CPI is also adjusted for interest charges prior to September quarter 1998 and deposit & loan facilities to June quarter 2011.

Sources: ABS; RBA

3.2.6 Interest rates

Interest rates rose over the first part of the terms of trade boom, from a bit below to a bit above their average over the post-1992/93 period. In part, this reflected the response of monetary policy to inflationary pressures building on the back of the boom in the terms of trade, as well as the increasing return to capital in Australia at that time. Thereafter, interest rates declined sharply in response to the global

16 The picture is similar if utility prices are excluded from the calculation.
17 See Balassa (1964) and Samuelson (1964).

financial crisis. There has been considerably less adjustment of interest rates in the current episode, however, relative to earlier terms of trade booms. One reason is that the flexible exchange rate now provides a considerable buffer against external shocks, so that less adjustment of interest rates is required to manage domestic monetary conditions (Debelle and Plumb 2006).

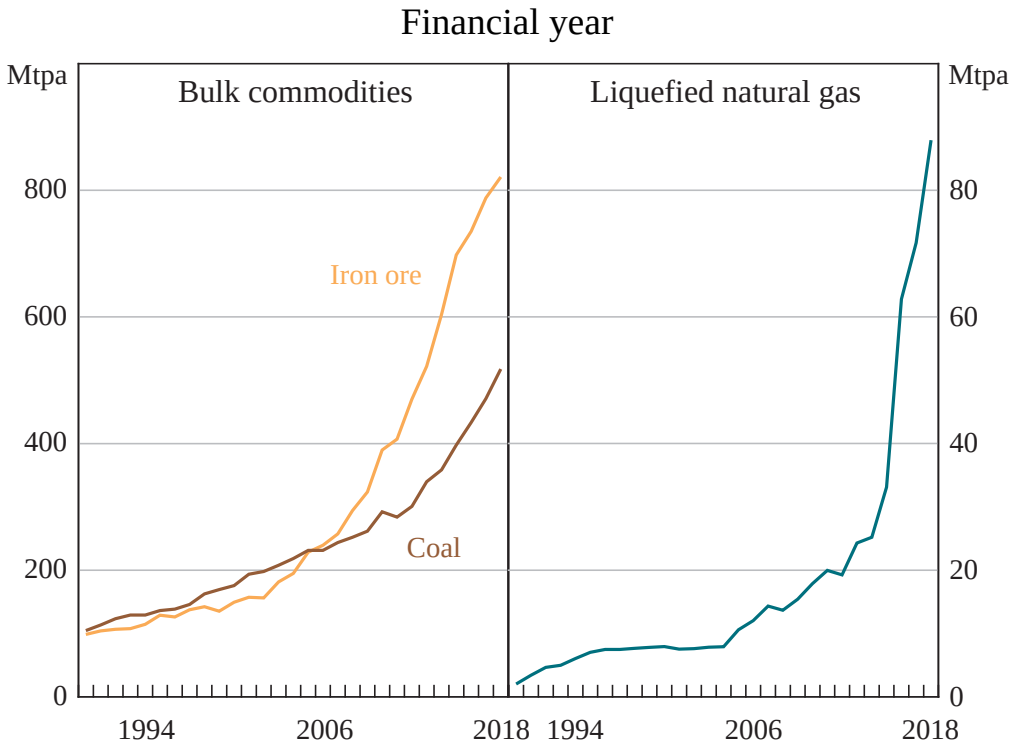
3.3 Phase III: Mining Production and Exports

3.3.1 Mining production and exports

The response of mining production and exports to the increase in commodity prices followed with some delay, reflecting the time needed to plan, gain approval for, and reallocate scarce productive inputs to enable construction of new infrastructure. For some resource commodities, there has already been a significant pick-up in output and exports. Since the onset of the terms of trade boom, the volume of iron ore extracted and exported has risen at an annual rate of 11¼ per cent (Figure 16). LNG extraction has also risen strongly. Coal production has expanded, but at a broadly similar pace to its pre terms of trade boom average, in part reflecting a sluggish recovery in coal production from the floods in early 2011.

Given the significant expansions in capacity in the resource sector over recent years, and the lag between investment and the corresponding output, the production phase of the resource boom is expected to gather momentum over the next couple of years. In its projections published in March 2013, the Bureau of Resources and Energy Economics anticipated strong growth in iron ore and coal exports over the next half decade, of around 9¾ per cent per year (Figure 16). Growth in exports of LNG is expected to be even stronger, and this could see Australia emerge as the second largest global supplier of LNG in coming years (Jacobs 2011). With the terms of trade forecast to decline gradually over time, it is likely that the growth in the *value* of resource exports will be less than the growth in the volumes.

Figure 16: Selected Resource Exports



Note: BREE projections for 2012/13–2017/18 as at March 2013

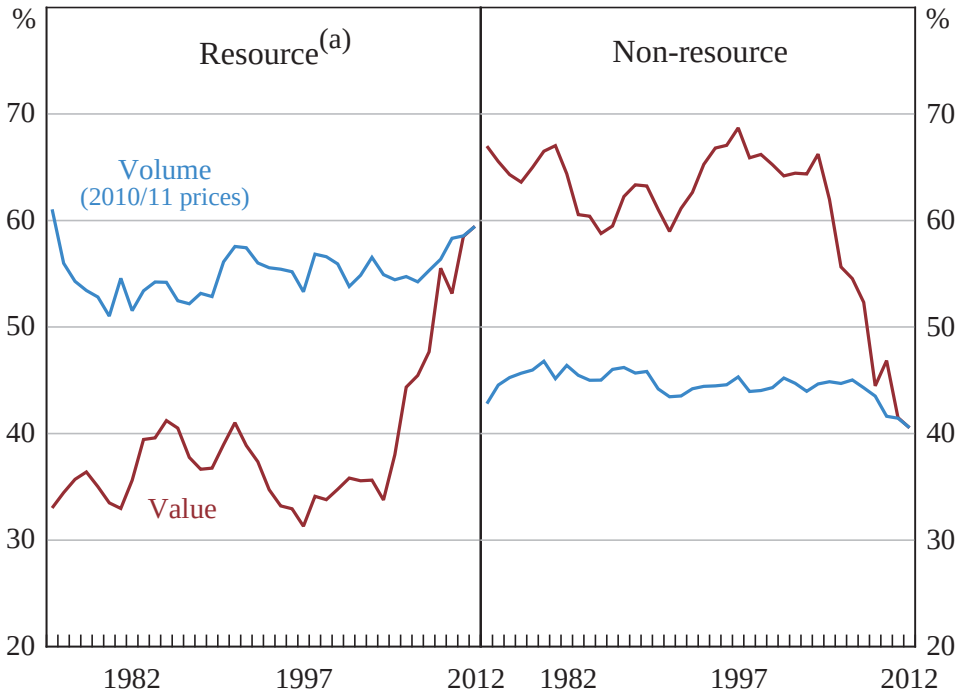
Source: Bureau of Resources and Energy Economics (BREE)

The strong growth in production and exports of these commodities over recent years has been offset, to a large extent, by weaker performance in other resource commodities. Most notably, oil production peaked in 2000, and since then has fallen by around 45 per cent as a result of the exhaustion of several of Australia's major oil basins. Exports of processed metals also remains below its levels in the early 2000s, and growth in non-ferrous metal ore exports (which include bauxite, copper ore, gold ore and nickel ore) has been sluggish relative to growth in iron ore, LNG and coal exports.

Reflecting these offsetting developments, the volume of Australia's total resource exports has risen at an annual rate of 3½–4 per cent over the course of the terms of trade boom (Table 1 and Figure 17). This is a notable slowing from its 1993–2003 average of 5½ per cent, notwithstanding a more than doubling of the capital stock and employment in the resource extraction sector. However, as noted above, the volume of Australia's resource exports is expected to increase at a faster pace in coming years as a result of the increase in investment.

Figure 17: Exports by Sector

Share of total exports, financial year



Note: (a) Excludes RBA gold transactions

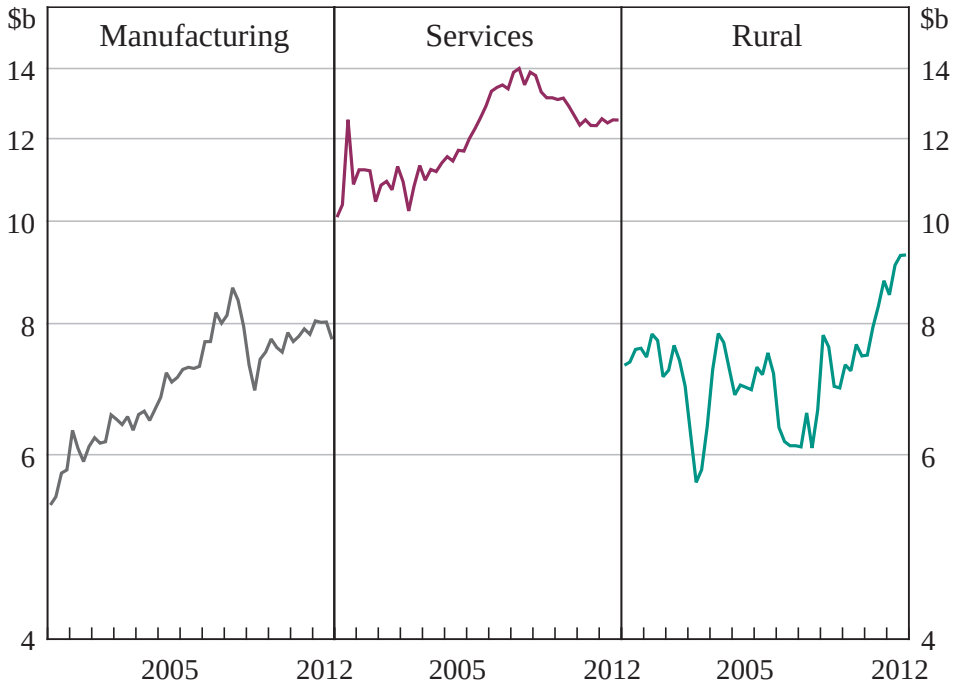
Sources: ABS; RBA

3.3.2 Non-resource exports

The high level of the exchange rate and the impact of the global financial crisis on external demand have weighed on exports of non-resource goods and services. Exports of manufactured products from Australia remain well below their 2008 peak, even though the volume of global trade has surpassed its 2008 level (Figure 18). In particular, some of Australia's more traditional manufacturing export sectors, such as construction materials and road vehicles, are well down on their earlier levels. That said, there has been growth in some categories of manufactured exports, including specialised industrial machinery and professional and scientific instruments.

Figure 18: Non-resource Export Volumes

Log scale, quarterly



Note: 2010/11 prices

Source: ABS

Exports of services have also declined significantly since 2008, although this also reflects the tightening of conditions for obtaining student visas, and more recently there has been some recovery in exports of tourism. In contrast to the softness in manufactured and services exports over recent years, rural exports have grown strongly, helped by improved rainfall and relatively high prices for many rural commodities.

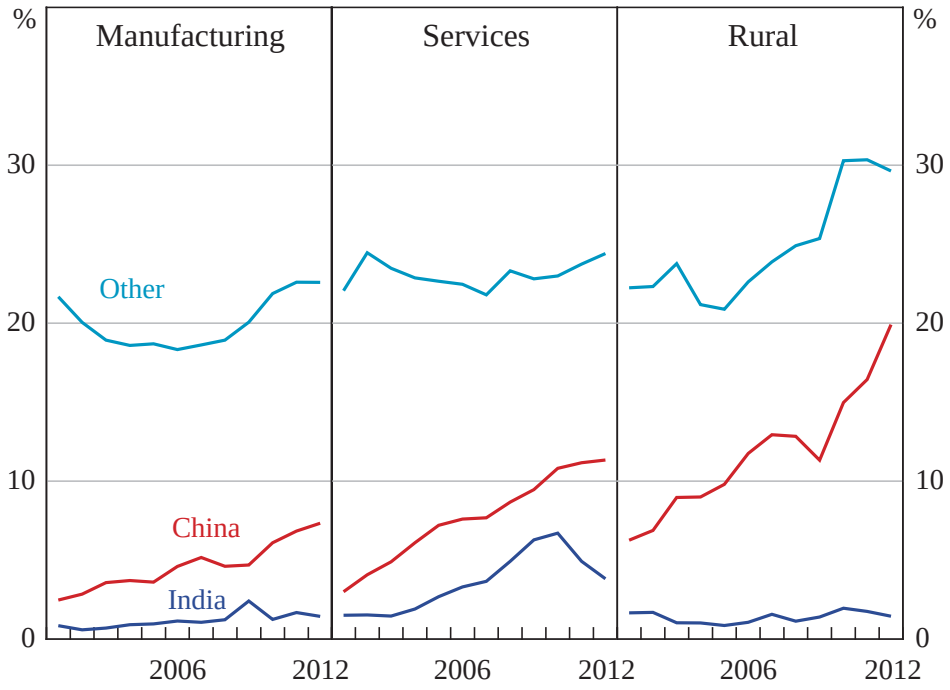
The strong growth of economic activity in Asia is clearly evident in the shares of Australian exports by destination. In 2011/12, Asian economies (excluding Japan) accounted for half of Australia's rural exports, compared to around one-third in 2000, and over 30 per cent of manufactured exports (Figure 19).[18] The share of Australia's services exports to non-Japan Asia has also increased, underpinned by strong growth in exports of education services. Also, short-term arrivals from China have been increasing rapidly – by around 13 per cent per annum over the

18 In this section, Asian economies include China, Hong Kong SAR, India, Indonesia, Korea, Malaysia, the Philippines, Singapore, Taiwan, Thailand and Vietnam.

past five years to be the second most important source of short-term arrivals (after New Zealand).

Figure 19: Non-resource Exports to Non-Japan Asia

Share of respective category of exports, financial year



Source: ABS

3.4 Beyond the Resource Investment Boom

The phase of strongly rising commodity prices has now passed. The economy is still in the midst of the boom in resource investment, although prospects are that it will peak sometime this year. So it is important to consider how the broader economy might evolve as the resource sector transitions from the investment phase to the production phase of the boom.

The stylised framework of Section 2 can help us think about the evolution of the economy as this transition occurs. An efficient, forward-looking foreign exchange market should already have factored in the expected decline in commodity prices associated with the gradual increase in global supply. To the extent that commodity prices and the terms of trade decline by more than anticipated, this would be expected to lead to a further depreciation of the exchange rate. Even if this were not the case, with the mining production phase less labour intensive than resource

investment, this should free up some labour to move back into the 'other tradable' and non-tradable sectors, and wage pressures should moderate. This could lead to a reduction in domestically sourced cost pressures, although this will be offset to some extent by greater imported cost pressures arising from any exchange rate depreciation should that occur. This would also provide stimulus to the 'other tradable' sector by improving its international competitiveness.

In terms of how this translates to recent and expected developments in the Australian economy, we have already witnessed a decline in the terms of trade, which has decreased by around 17 per cent from the peak in September 2011. Current forecasts (as of the February 2013 *SMP*) suggest that the terms of trade will remain high in comparison to pre-boom levels. While it is impossible to be precise about the magnitude or the timing of near-term movements in commodity prices, this assumption seems reasonable on the grounds that industrialisation and urbanisation in China still has some way to run. For example, some estimates suggest that Chinese demand for steel used in residential construction will not peak until several years from now (Berkelmans and Wang 2012) – and the continued development of countries such as India, Indonesia and Vietnam will add significantly to global demand for commodities.

However, while the terms of trade have declined from their peak in late 2011, the Australian dollar remains at a high level by historical standards. One interpretation of this is that the decline in the terms of trade from their peak was anticipated and therefore already 'priced in' to the level of the exchange rate. But this ignores the unanticipated deterioration in the global economic outlook that underpinned the decline in commodity prices at that time. The high level of the Australian dollar might also reflect stronger economic growth in Australia relative to many other advanced economies over recent years, as well as increased demand for Australian dollar-denominated assets as other central banks attempt to stimulate their economies via large-scale expansion of their balance sheets (Lowe 2012a; Debelle 2013). How the economy adjusts in the years ahead will depend, in part, on how the exchange rate responds to economic developments; in particular, to the extent that the exchange rate does not depreciate in line with any unexpected declines in the terms of trade, this will affect the adjustment in other sectors of the economy, notably the 'other tradable' sector.

If the resource investment profile described above is realised, then overall demand for labour in the resource sector is expected to ease at some point. By itself, this would tend to lead to some moderation in inflationary pressures in the non-tradable sector. Conversely, any depreciation would exert some inflationary pressure on the prices of imported goods and services. Looking even further ahead, as Asian economies continue to develop and incomes rise, history suggests that demand will broaden beyond resources to other goods and services. Given the population of developing Asia, the Asian market is large and is expected to get much larger still; by 2020, more than half of the world's 'middle class' could be in Asia (Kharas 2010). From Australia's perspective, this could result in rising Asian demand for industries such as tourism, education, financial and other professional services, food and agribusiness, and specialised manufacturing, particularly related to agriculture and mining. As noted above, there is some evidence that this is already occurring.

Another important feature of emerging Asian economies that will have implications for Australia is the continued development and integration of Asian financial markets. While the economies of Asia are highly integrated into the global trading system for goods and services, this is less true of financial systems in general across Asia (Lowe 2009). Even though saving ratios have been higher than investment ratios in emerging Asia in recent years these 'excess savings' have predominantly been channelled to the rest of the world by the public sector as authorities, such as central banks and sovereign wealth funds, buy foreign assets. While investment in Australia from emerging Asian economies has grown in recent years, it still represents only a small share of total foreign investment in Australia. For example, Chinese investment in Australia has increased rapidly since the mid 2000s – driven by strong foreign direct investment, particularly in the Australian resource sector – but still represented only 1 per cent of total foreign investment in Australia at the end of 2011 (investment from the United States in Australia was 27 per cent of the total).

4. Conclusion

Strong growth in Asia is expected to continue to provide significant benefits for the Australian economy. Most notable so far has been the resource boom. The first phase of this saw commodity prices and hence Australia's terms of trade rise

significantly over a period of a number of years. This phase appears to have passed, with the terms of trade having peaked in late 2011, although they remain at a high level. The second phase, the surge in investment in the resource sector, has been in progress for some years and still has some way to run, with resource investment expected to peak as a share of GDP sometime over the course of this year, but remain quite high for a time. The third phase of increased production and exports of resources has also commenced but has much further to run, especially in the case of LNG, for which investment takes place over a number of years before production comes on stream.

The pattern of structural adjustment to the rise in the terms of trade has, to date, proceeded broadly in line with that suggested by a simple theoretical model. In particular, relative wages and prices have adjusted in a way that has facilitated the reallocation of labour and capital towards the resource sector. While not all parts of the economy have benefited from the boom, the process of macroeconomic adjustment has occurred relatively smoothly compared to previous booms; inflation has been consistent with the target, unemployment has remained relatively low and output has grown at close to trend rates. This stands in stark contrast to some earlier episodes of terms of trade booms in Australia. One critical element to the adjustment this time around has been the timely appreciation of the nominal exchange rate as the terms of trade were rising. The adjustment has also been helped by the anchoring of inflation expectations and the operation of the labour market, whereby wage pressures in industries or regions experiencing strong conditions associated with the resource boom have not spilled over to parts of the economy experiencing weaker conditions.

A significant proportion of the employment growth in the resource sector over recent years has been driven by the relatively more labour-intensive activities associated with resource investment. Once resource investment peaks, demand for labour in the resource sector is expected to decline and the contribution of resource investment to output growth will turn around. Part of this will be replaced by increased production and export of resources. The extent to which a pick-up in other activity requires a shift in relative prices, including through the exchange rate, remains to be seen.

Looking further ahead, there will come a time when the demand for commodities will ease as the development of economies in the Asian region continues and the focus of consumption shifts away from goods and towards services. Such a transformation might appear to be disadvantageous for economies such as Australia that have hitherto been focused on supplying these economies with commodities. However, rising demand for household, business and financial services in Asia has the potential to be relatively advantageous for the Australian economy, in part because it is closer to this region than it is to most advanced economies, but also because of its well-developed and relatively open services sector.

Appendix A: Data

Table A1 presents the import penetration and export propensity for the 19 ABS industry divisions, based on ABS input-output tables for 2008/09.

Table A1: Sector Definitions and Trade Exposure
2008/09, per cent

	Import penetration[(a)]	Export propensity[(b)]
Mining	**13**	**60¾**
Other tradable	**22**	**18¼**
Agriculture, forestry & fishing	2	15½
Manufacturing	33½	22
Wholesale trade	0	10¼
Accommodation & food services[(c)]	8¾	11½
Transport, postal & warehousing	8½	19½
Non-tradable	**1½**	**1½**
Electricity, gas, water & waste services	0	0
Construction	0	¼
Retail trade	0	3
Information, media & telecommunications	7¾	2½
Financial & insurance services	1	1
Rental, hiring & real estate services	1¾	¾
Professional, scientific & technical services	3¾	3¾
Administrative & support services	1¾	1¾
Public administration & safety	0	¼
Education & training	2¾	7¾
Health care & social assistance	½	½
Arts & recreation services	3	4
Other services	¾	½

Notes: (a) Import penetration equals competing imports as a share of the total supply of the corresponding domestic industry
(b) Export propensity equals exports as a share of total production in each industry
(c) Due to data limitations, the accommodation & food services industry is included in the non-tradable sector in Figures 6–9

Sources: ABS; authors' calculations

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